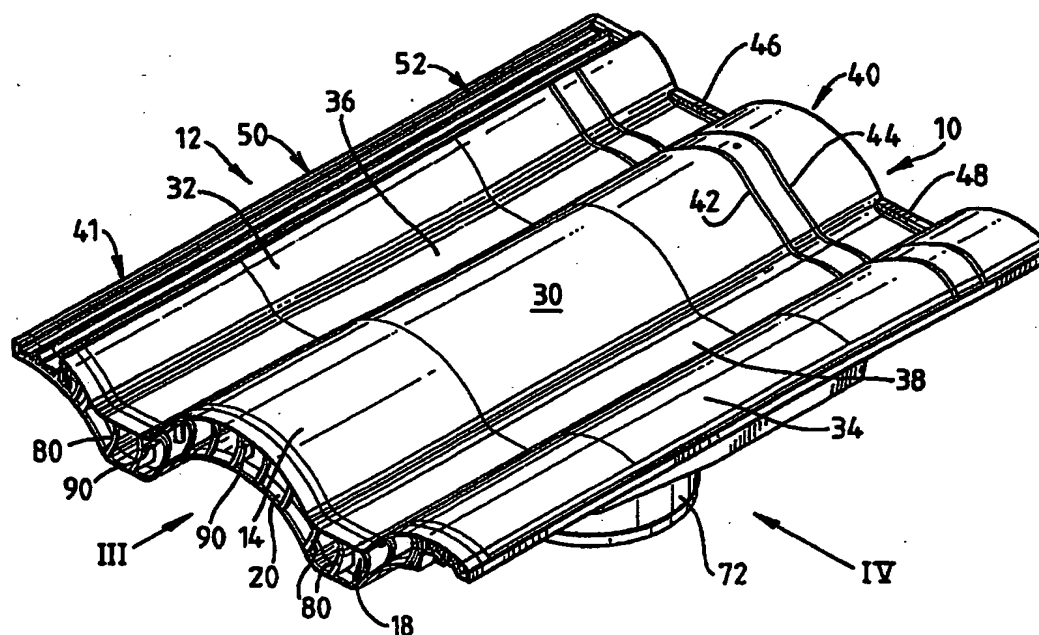


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : E04D 1/30, 13/16	A1	(11) International Publication Number: WO 98/157 (43) International Publication Date: 16 April 1998 (16.04)
(21) International Application Number: PCT/EP97/05297 (22) International Filing Date: 26 September 1997 (26.09.97) (30) Priority Data: 9620731.1 4 October 1996 (04.10.96) GB (71) Applicant (for all designated States except US): RBB RESEARCH & DEVELOPMENT LIMITED [GB/GB]; Redland House, Reigate, Surrey RH2 0SJ (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): HENSEY, Paul, Stanley [GB/GB]; 60 Earlswood Close, Horsham, West Sussex RH13 6PB (GB). PAYNE, Simon, Robert [GB/GB]; 5 Redgarth Court, Furze Lane, Felbridge, West Sussex RH19 2SF (GB). (74) Agent: GRANT, John, Stephen, Shirley; IP Dept., Redland House, Reigate, Surrey RH2 0SJ (GB).		(81) Designated States: AU, BG, BR, BY, CA, CN, CZ, DE, EE, GE, HU, JP, KR, LT, LV, NO, NZ, PL, RU, SI, UA, US, YU, European patent (AT, BE, CH, DE, DK, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending claims and to be republished in the event of the receipt of amendments.</i>

Best Available Copy

(54) Title: ROOF VENTILATOR**(57) Abstract**

A covert roof ventilator (10) is manufactured by rotation moulding from plastics material and is provided with an upper wall (12) of a shape complementary to roof tiles with which it is to be used an apertured lower wall (16) spaced from the upper wall with an elongated aperture (18) formed at a toe portion of the ventilator for receiving a combined grille (20) and baffle (22) the former for preventing ingress of small mammals and birds to the inside of the ventilator and the latter for preventing the ingress of driven rain and/of snow large insects to the inside of the ventilator and to the underside of the apertured lower wall thereof.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the I

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

ROOF VENTILATOR

This invention is concerned with improvements in a roof ventilator and is particularly concerned with a covert ventilator for pitched tiled roofs.

Since the advent of ventilation devices for use on pitched tiled roofs, many variations of device have been proposed most of which are provided by overt configurations which extend above a plane of the tiled roof and appear somewhat obtrusive and not altogether aesthetically pleasing. Lately, however, in response to the wishes of architects and designers, efforts have been made to introduce covert designs of roof ventilator which are aesthetically pleasing in that they do not detract from the symmetry of a roofscape in which they are used.

Examples of roof ventilators are disclosed in GB 2199860, see Figures 17 and 22, GB 2262295, see Figure 4, GB 2279675, see Figure 4, GB 2285817, see Figure 2, German GbM 9308401, see Figure 3b and EP 0663487, see Figure 5. One of the main disadvantages of these and other prior art ventilators resides in their method of manufacture in that they are usually comprised of several pre-formed pieces of plastics material which are joined together by a suitable epoxy adhesive. Because the ventilators are formed in this way they are susceptible to deterioration, at the sealed joints between the pre-formed pieces thereof. This in turn causes the ingress of rainwater to the underside of the tiles on a roof with the result that the fabric of the dwelling may be harmed.

In addition, several ventilators include upwardly facing grille members for facilitating the ventilation of the underside of the tile and roof space, see GB 2199860 and GbM 9308401. Such arrangements are susceptible to internal blockage due to excess detritus collecting within the ventilator. Other ventilators, see GB 2262295 and EP 0663487 are provided with elongate ventilation apertures at a toe end portion of the ventilator unit; however, no provision is made for preventing the ingress of small mammals and birds or driven rain and snow to the inside of the ventilator unit. This

may be particularly deleterious in inclement weather conditions when driven snow may pack into the ventilator and interfere with its efficiency.

The present invention seeks to obviate or mitigate the drawbacks of the prior art ventilators and thus provides a roof ventilator provided by a hollow tile-shaped unit provided with an upper wall of shape complementary to tiles with which the ventilator is used and an apertured lower wall spaced therefrom, the unit comprising an elongate aperture between the upper and lower walls at a toe portion of the unit characterised in that the ventilator comprises a grille member located within the aperture of said unit for limiting the ingress of small mammals and birds, the ventilator also comprising a baffle means located within said unit for limiting the ingress of driven rain and/or snow and large insects to the inside of the unit and the underside of the apertured lower wall.

Preferably the grille member and the baffle means are integrally formed one with the other.

Conveniently the grille member and the baffle means are conjoined by connecting ribs which, when the grille member and the baffle means are located as aforesaid, extend longitudinally of said unit between the upper and lower walls to add rigidity and strength to the unit.

The tile-shaped unit provided by the present invention is preferably formed by rotational moulding from a plastics material, viz. polyethylene or a polypropylene coated polyurethane.

Conveniently the conjoined grille member and baffle means are moulded from a plastics material, e.g. polyvinylchloride (PVC).

The present invention also conveniently provides a method of manufacture of a roof ventilator comprising a hollow tile-shaped unit having an upper wall of shape complementary to tiles with which the ventilator is used and an apertured lower wall spaced therefrom, the unit comprising an elongate aperture between the upper and

lower walls at a toe portion of the unit characterised in that the tile-shaped unit is produced by rotational moulding and the elongate aperture is formed by cutting away an extreme toe portion of the unit wherein a preformed grille member and baffle means is inserted to close the elongate aperture to the ingress of driven rain, small birds and large insects when the ventilator is in use.

In the method of the last preceding paragraph, the tile-shaped unit is conveniently made from a plastics material, viz. polyethylene or polypropylene coated polyurethane and the pre-formed grille member and baffle means are moulded from a plastics material, viz. polyvinylchloride (PVC).

There now follows by way of example of the invention a specific description of the novel ventilator and its method of manufacture which description is to be read with reference to the accompanying drawings in which:

- Figure 1 is a right-hand upper perspective view of the novel roof ventilator;
- Figure 2 is a left-hand lower perspective view of the novel roof ventilator;
- Figure 3 is a view in the direction of the arrow III in Figure 1;
- Figure 4 is a view in the direction of the arrow IV in Figure 1;
- Figure 5 is an exploded right-hand upper perspective view with an upper wall of the ventilator removed to reveal the inside of the ventilator;
- Figures 6 and 7 are views corresponding to Figure 5 showing the interrelationship of parts of the ventilator during the assembly thereof;
- Figure 8 is an underside view of the ventilator of Figure 1;
- Figure 9 is an upper view of the ventilator of Figure 1; and,
- Figure 10 is an upper perspective view of a tiled roof incorporating a ventilator provided by the present invention.

Over recent years, the development of roof ventilators has led to the design of covert roof ventilators. In overcoming the perceived disadvantages of prior art roof ventilators, the present invention provides a roof ventilator 10 which comprises a hollow tile-shaped unit 12 having an upper wall 14 which is of complementary shape to the tiles T with which it is intended to be used, see Figures 1 and 10, and an apertured

lower wall 16 spaced from said upper wall, the unit also comprising an elongate aperture 18 between the upper and lower walls 14 and 16 at a toe portion of the ventilator. The ventilator also comprises a grille 20 located in said aperture 18 to prevent the ingress of small mammals and birds to the inside of the tile-shaped unit 12 and the ventilator 10 further comprises a baffle means 22 located within said tile-shaped unit to prevent the ingress of driven rain and snow to the inside of the unit 12 and thus to an underside of the apertured lower wall 16.

The tile-shaped unit 12 is rectangular in plan, see Figure 9 and the upper wall 14 thereof has the configuration of a so-called "Roman" type tile having a centre roll portion 30 and two opposite side roll portions 32 and 34 extending from an upper headlap portion 40 to a lower toe portion 41 of the wall 14. The roll portions 32 and 34 are separated from the centre roll portion 30 by intermediate trough portions 36 and 38 respectively, see Figure 1.

The upper wall 14 is provided with water channels 42 and 44 extending laterally of the headlap portion 40 and water bars 46 and 48 at the upper extremities of the trough portions 36 and 38 respectively, see Figure 1.

Along a left-hand side 50 thereof the upper wall 14 is provided with an upwardly facing channel portion 52 adapted for mutual engagement with a sideways adjacent roof tile when in use.

The lower wall 16 comprises a headlap portion 60 having two depending lugs 62 and 64 moulded therein for supporting the ventilator on a roof batten when the ventilator is in use, see Figures 2, 4 and 8 for details of the lugs 62 and 64. The lower wall 16 also comprises a toe portion 66 which has the inverse configuration of a so-called "Roman" type tile, see Figure 2, to facilitate the mutual interlock of the ventilator with tiles laid therebelow when the ventilator is in use.

Between its headlap portion 60 and its toe portion 66, the apertured lower wall 16 comprises a central well portion 70 on which is formed a depending cylindrical spigot

72, see Figures 1, 2, 3, 4, 5, 6, 7 and 8, which, extends from an aperture 17 formed in the wall 16 and which, when the ventilator is in use, may be connected to a soil pipe or any like device, not shown.

The grille 20, see Figures 1, 5, 6 and 7, is shaped to complement the configuration of the aperture 18 formed between the upper and lower walls 14 and 16 and is an elongate moulded structure provided with a series of vertically disposed bars 80 at spaced intervals therealong, the spacing of the bars 80 being such that small mammals and birds cannot enter into the inside of the tile-shaped unit 12 when the grille 18 is positioned as shown in Figures 1 and 7.

The baffle means 22, see Figures 5, 6 and 7, is also shaped to complement the configuration of the aperture 18 formed between the upper and lower walls 14 and 16 and is also an elongate moulded structure provided with a series of four laterally disposed baffles 82 connected together by a series of five strengthening ribs 84 which extend at right angles or substantially so to the baffles 82. The ribs 84 extend longitudinally of the ventilator when the baffle means 22 is assembled therein, see Figure 7.

The grille 20 and baffle means 22 are connected together as an integral unit before assembly into the tile-shaped unit 12. For this purpose, the grille 20 is provided with female housings 90 on selected ones of the bars 80 thereof which housings 90 are adapted to receive in locking engagement "spigot" means 92 provided on end portions 94 of the ribs 84, see Figures 3, 5, 6 and 7.

It will be fully appreciated that the size of the aperture 18 and the spacings between the bars 80 and the spacings between the baffles 82 are chosen in order that an adequate flow of ventilation air is facilitated between the outside and inside of the roof structure on which the novel ventilator is used.

Should any driven rain or snow by-pass the baffles 82, in order to prevent ingress thereof to the underside of the unit 12, an upstanding wall 100 is provided in the well portion 70 partially surrounding the aperture 17, see Figures 5, 6 and 7.

The lower wall 16 is also provided with an upwardly extending spigot 102 moulded in its headlap portion, see Figures 5, 6 and 7, which spigot 102 adds strength to the moulded unit and also facilitates the fastening of the unit to a roof batten by appropriate means, e.g. a nail.

The novel roof ventilator provided by the invention is manufactured as three separate parts.

The tile-shaped unit is formed by a rotational technique from a suitable plastics material, e.g. polyethylene or a polypropylene coated polyurethane.

The baffle 22 and grille 20 are moulded from a polyvinylchloride material.

Before assembly of the baffle 22 and grille 20 into the tile-shaped unit 12, an extreme end portion of the unit 12 must be cut-off to create the aperture 18.

The baffle 22 and grille 20 are then assembled together by inserting the spigot means 92 of the baffle 22 into the housings 90 of the grille 20, see Figure 5.

The assembled baffle and grille are then offered up to the aperture 18, see Figure 6 whereupon full insertion of the assemblage into the unit 12, see Figure 7, is achieved when keying means (not shown) on the grille 20 becomes engaged in locking engagement with detents (not shown) provided in the inside walls of the unit 12.

In use on a roof as shown in Figure 10, the roof ventilator of the present invention facilitates the full ventilation of the underside of the tiles or the roof space beneath the tiles while presenting a most aesthetically pleasing roof line.

It will be realised that the colour and surface finish of the ventilator may be chosen to suit the colour and finish to the roof tiles with which it is used.

While it is disclosed that the tile-shaped unit is made of polyethylene or polypropylene coated polyurethane, any suitable material which does not suffer from deleterious effects in inclement weather conditions may be used.

Likewise, the grille 20 and baffle means 22 may also be made from any suitable plastics material.

Because the roof ventilator of the present invention is in the main manufactured as a single unit by rotational moulding, it will not be susceptible to the deleterious effects presently suffered by premoulded units which are secured together by sealants of various kinds.

In addition, the ease with which the novel roof ventilator is made and used, plus its inherent strength when trafficked by a roofer, renders the ventilator most advantageous over the prior art ventilators referred to herein.

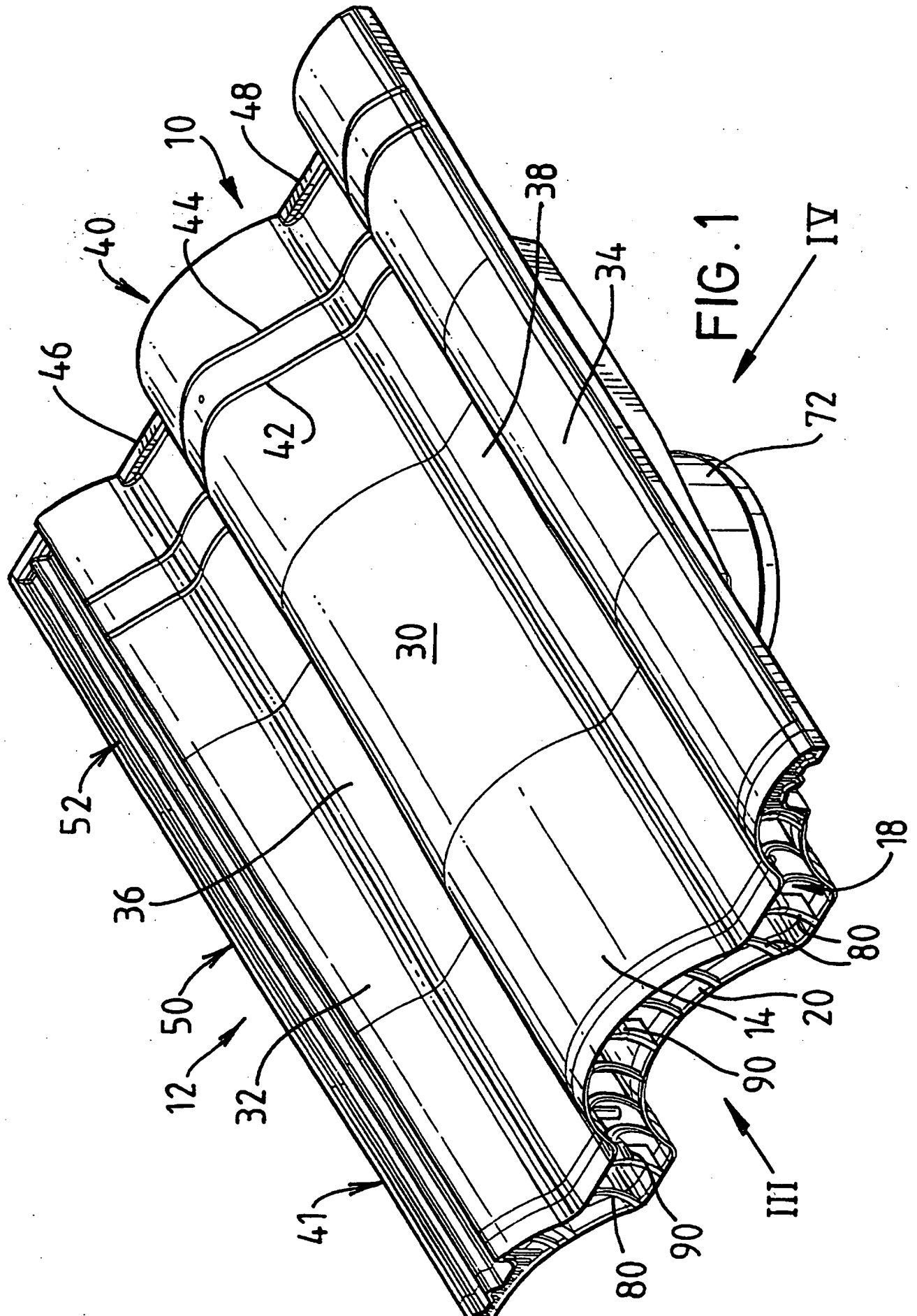
It will be readily appreciated that while the ventilator described herein by way of example of the invention has a shape and configuration akin to a so-called "Roman" type tile, the ventilators provided by this invention may be of suitable shape and configuration to match the roof tiles with which they are intended to be used.

CLAIMS

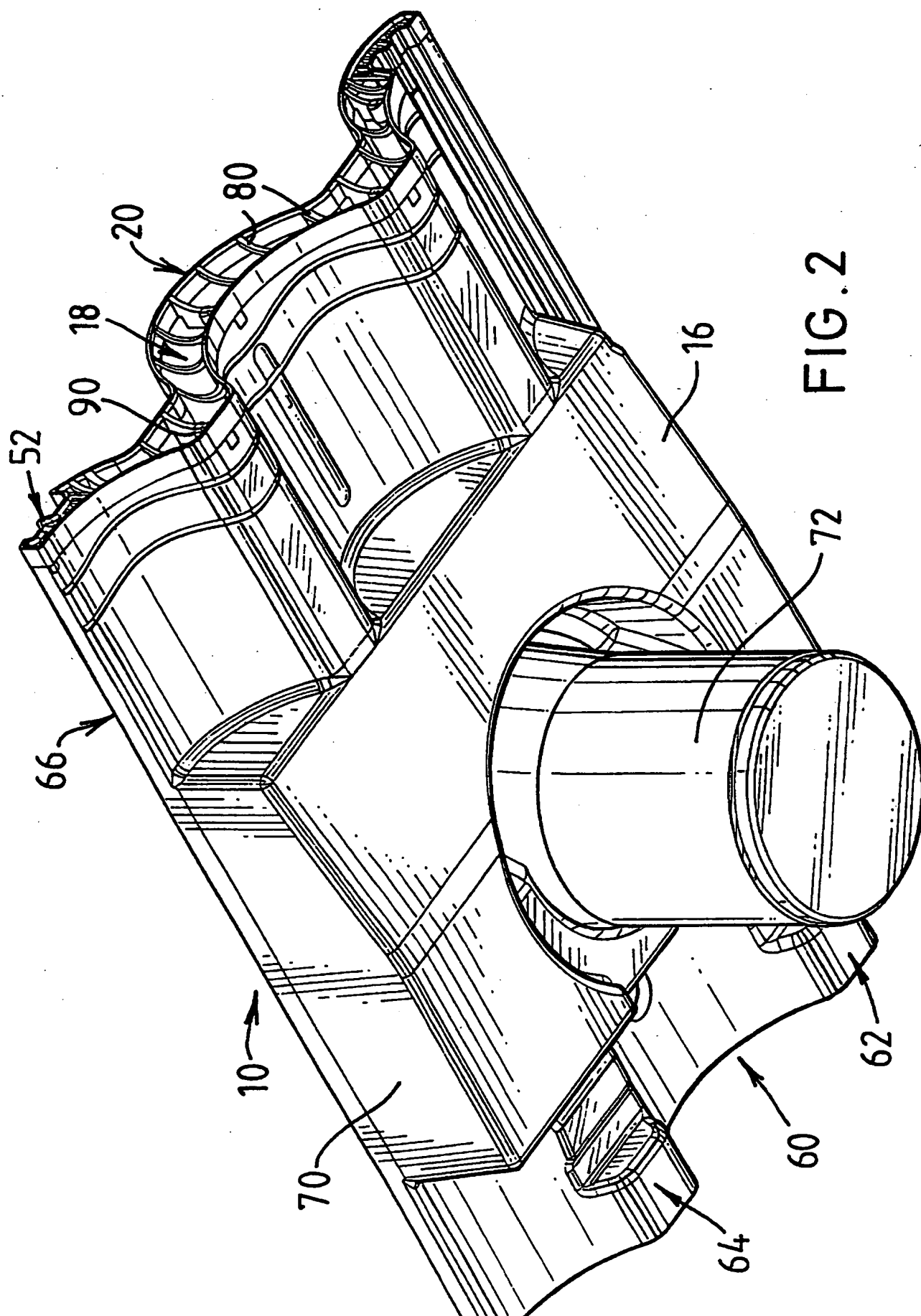
1. A roof ventilator provided by a hollow tile-shaped unit provided with an upper wall of shape complementary to tiles with which the ventilator is used and an apertured lower wall spaced therefrom, the unit comprising an elongate aperture between the upper and lower walls at a toe portion of the unit **characterised in that** the ventilator comprises a grille member located within the aperture of said unit for limiting the ingress of small mammals and birds, the ventilator also comprising a baffle means located within said unit for limiting the ingress of driven rain and/or snow and large insects to the inside of the unit and the underside of the apertured lower wall.
2. A roof ventilator according to claim 1 **characterised in that** the grille member and the baffle means are integrally formed one with the other.
3. A roof ventilator according to Claim 2 **characterised in that** the grille member and the baffle means are conjoined by connecting ribs which, when the grille member and the baffle means are located as aforesaid, extend longitudinally of said unit between the upper and lower walls to add rigidity and strength to the unit.
4. A roof ventilator according to any one of Claims 1 to 3 **characterised in that** the tile-shaped unit is formed by rotational moulding.
5. A roof ventilator according to any one of Claims 1 to 4 **characterised in that** the tile-shaped unit is made from a plastics material.
6. A roof ventilator according to Claim 5 **characterised in that** the plastics material is polyethylene.
7. A roof ventilator according to Claim 5 **characterised in that** the plastics material is a polypropylene coated polyurethane.

8. A roof ventilator according to any one of Claims 3 to 7 **characterised in that** the conjoined grille member and baffle means are moulded from a plastics material.
9. A roof ventilator according to Claim 8 **characterised in that** the plastics material is polyvynilchloride (PVC).
10. A method of manufacture of a roof ventilator comprising a hollow tile-shaped unit having an upper wall of shape complementary to tiles with which the ventilator is used and an apertured lower wall spaced therefrom, the unit comprising an elongate aperture between the upper and lower walls at a toe portion of the unit **characterised in that** the tile-shaped unit is produced by rotational moulding and the elongate aperture is formed by cutting away an extreme toe portion of the unit wherein a preformed grille member and baffle means is inserted to close the elongate aperture to the ingress of driven rain, small birds and large insects when the ventilator is in use.
11. A method according to any one of Claims 10 **characterised in that** the tile-shaped unit is made from a plastics material.
12. A method according to Claim 11 **characterised in that** the plastics material is polyethylene.
13. A method according to Claim 11 **characterised in that** the plastics material is a polypropylene coated polyurethane.
14. A method according to any one of Claims 3 to 7 **characterised in that** the pre-formed grille member and baffle means are moulded from a plastics material.
15. A method according to Claim 14 **characterised in that** the plastics material is polyvynilchloride (PVC).

1/10



2/10



3/10

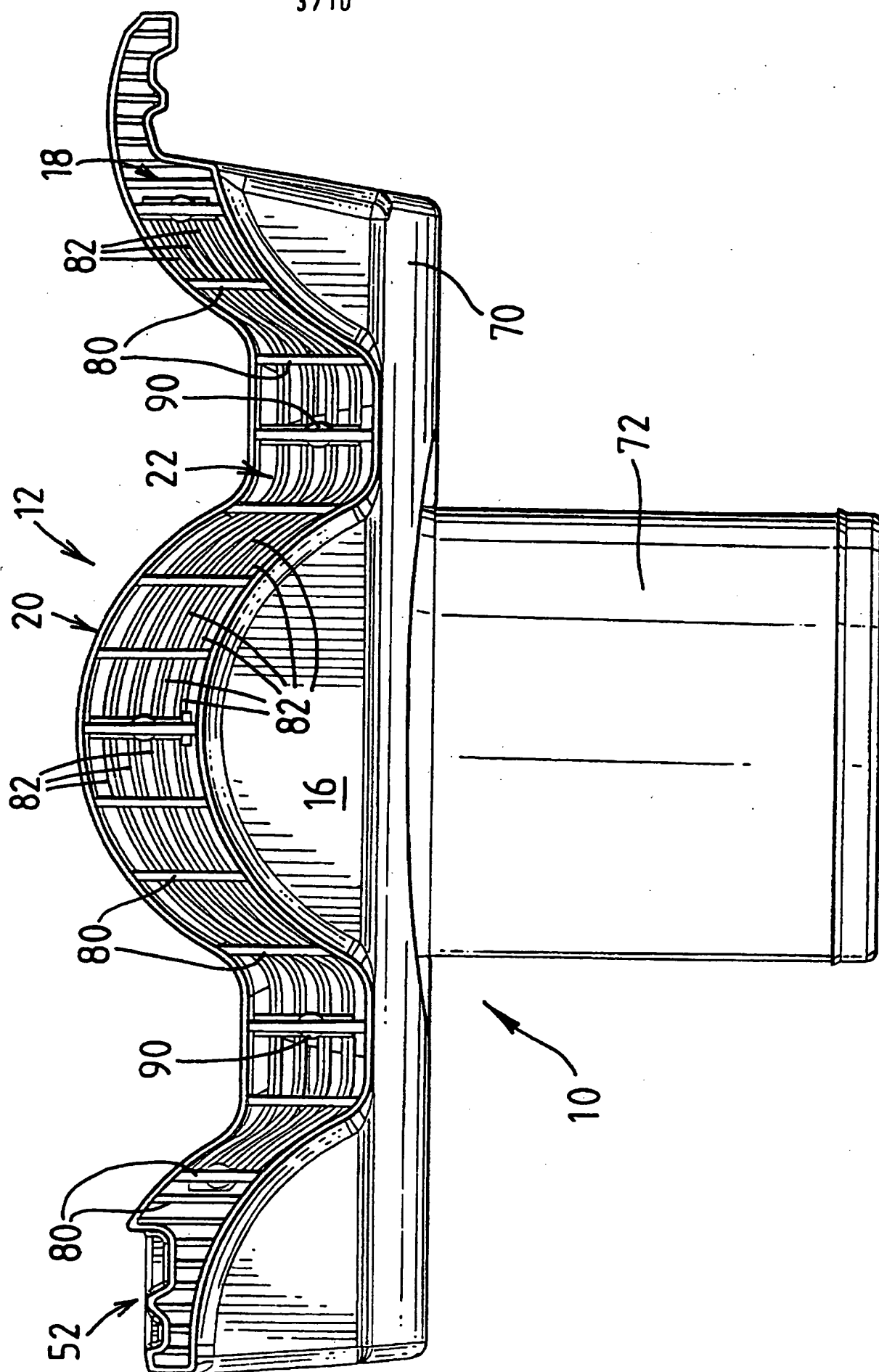
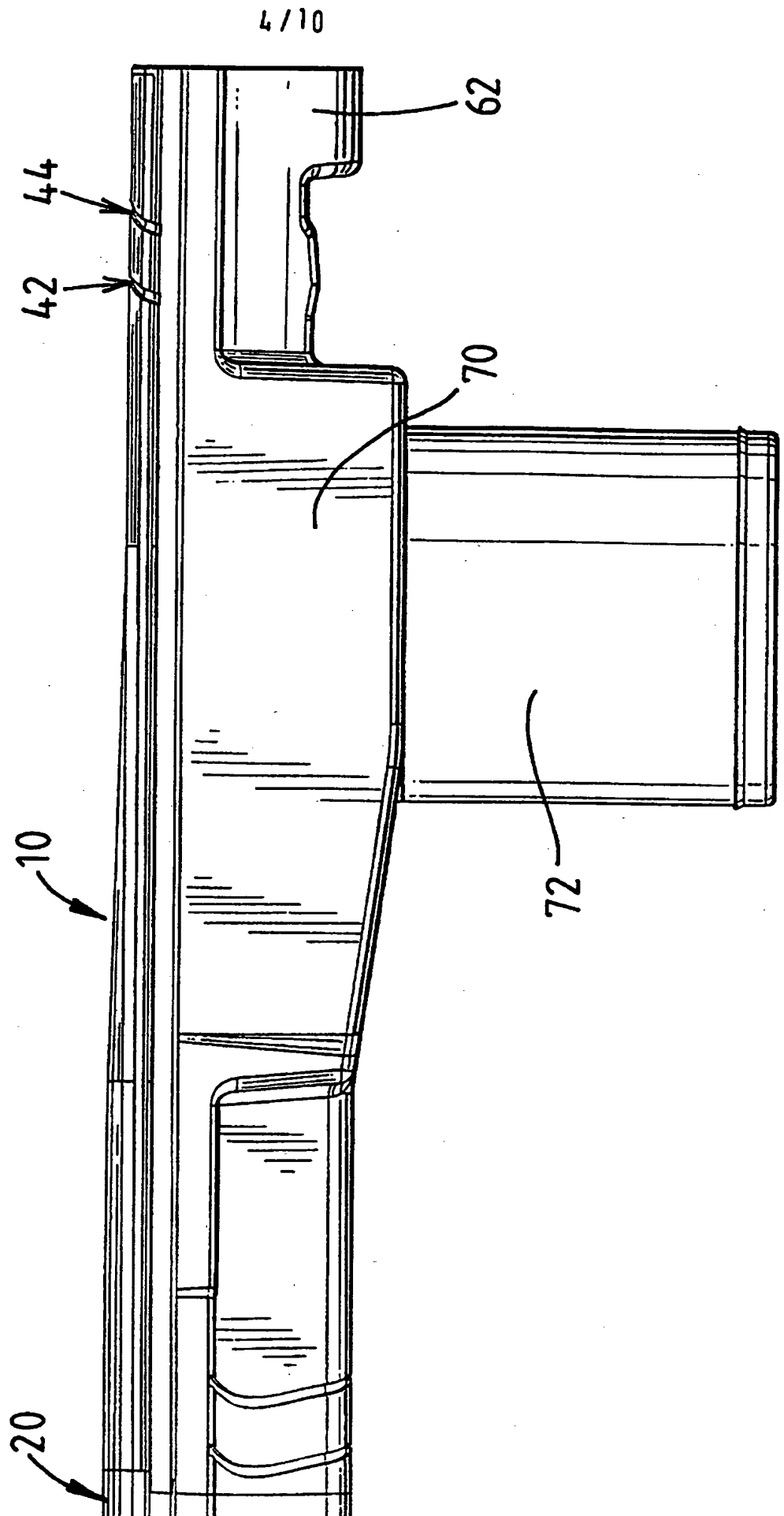
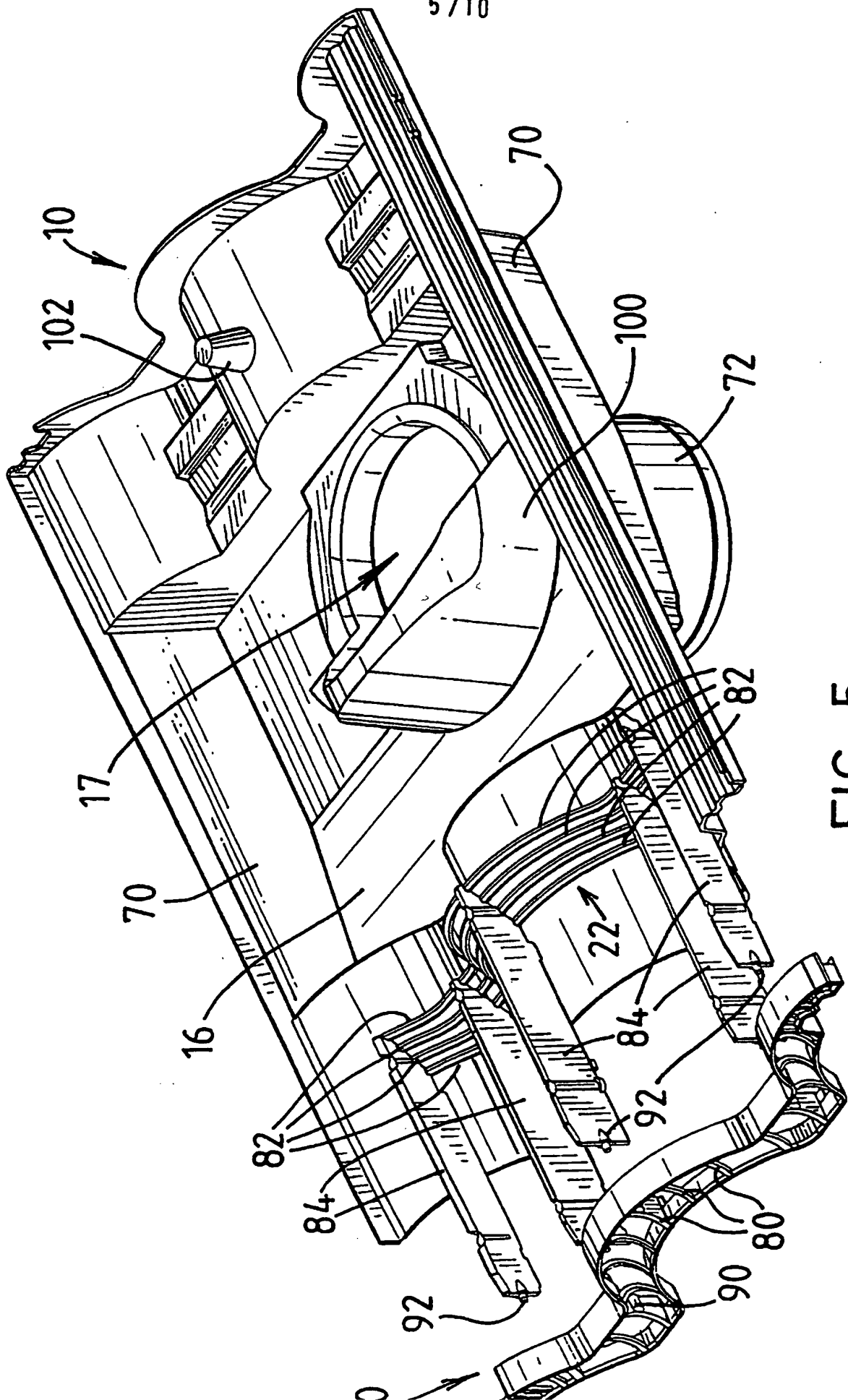


FIG. 3

FIG. 4

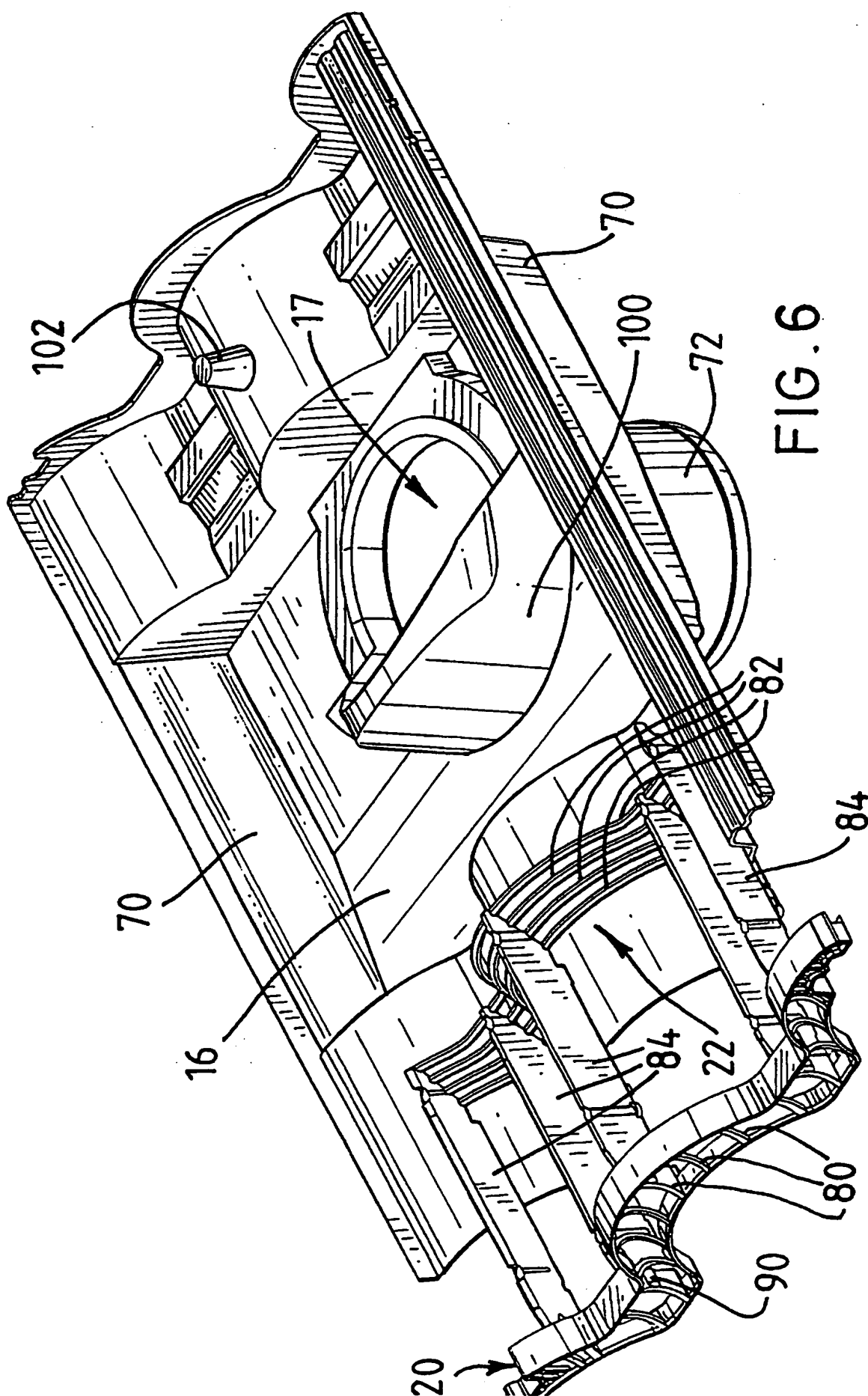


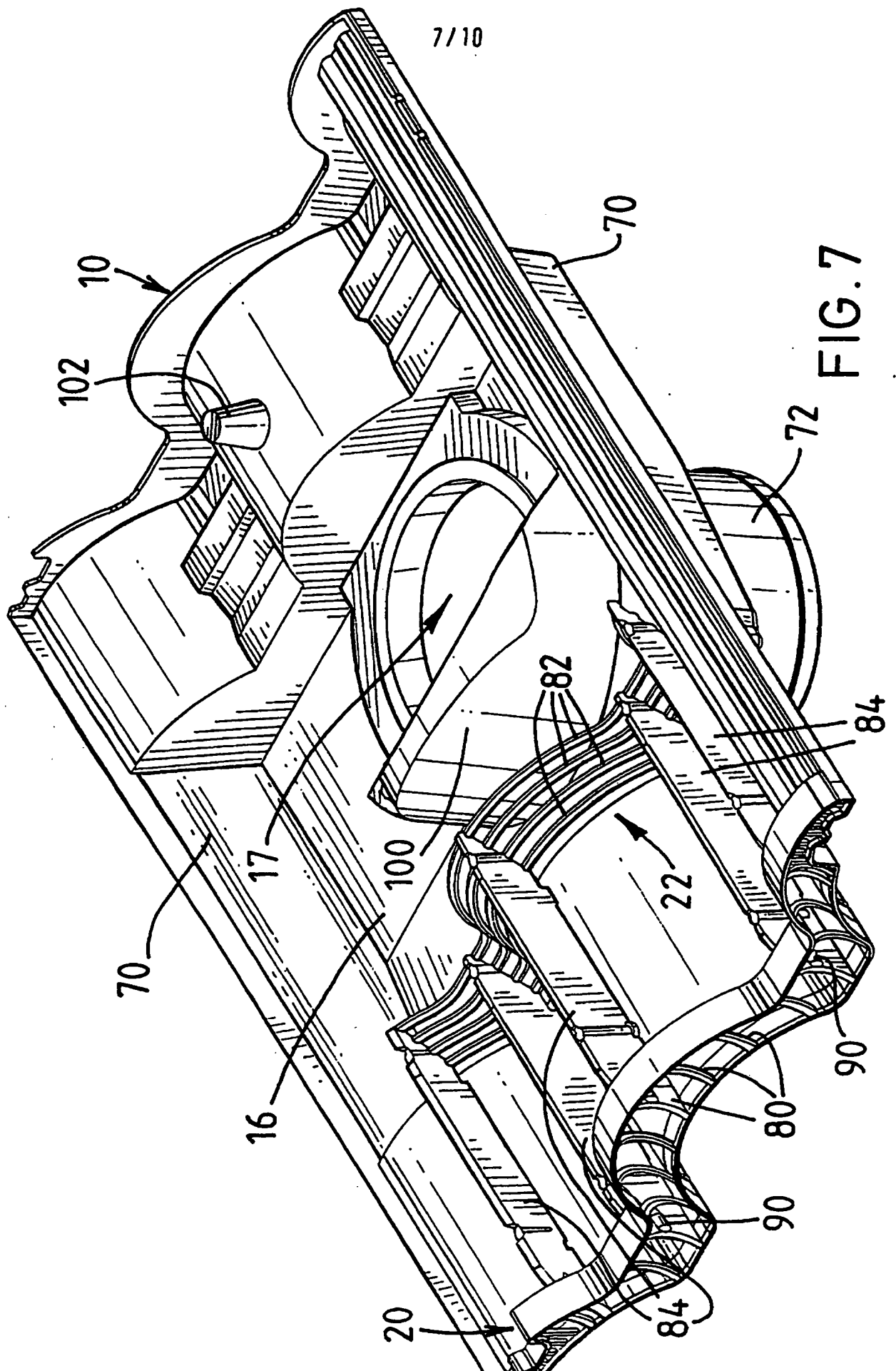
5 / 10



5. G. F.

6 / 10





8 / 10

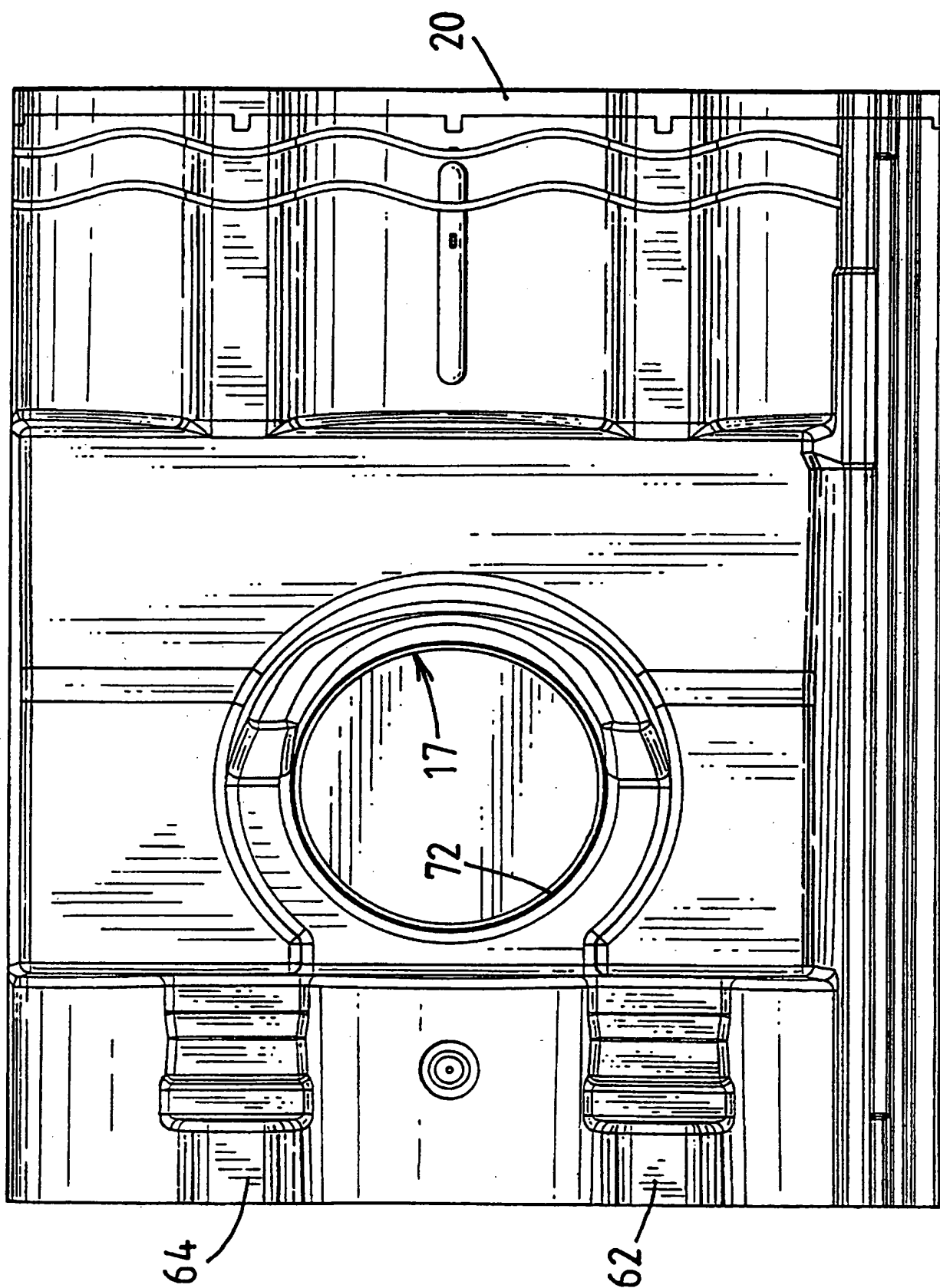


FIG. 8

9/10

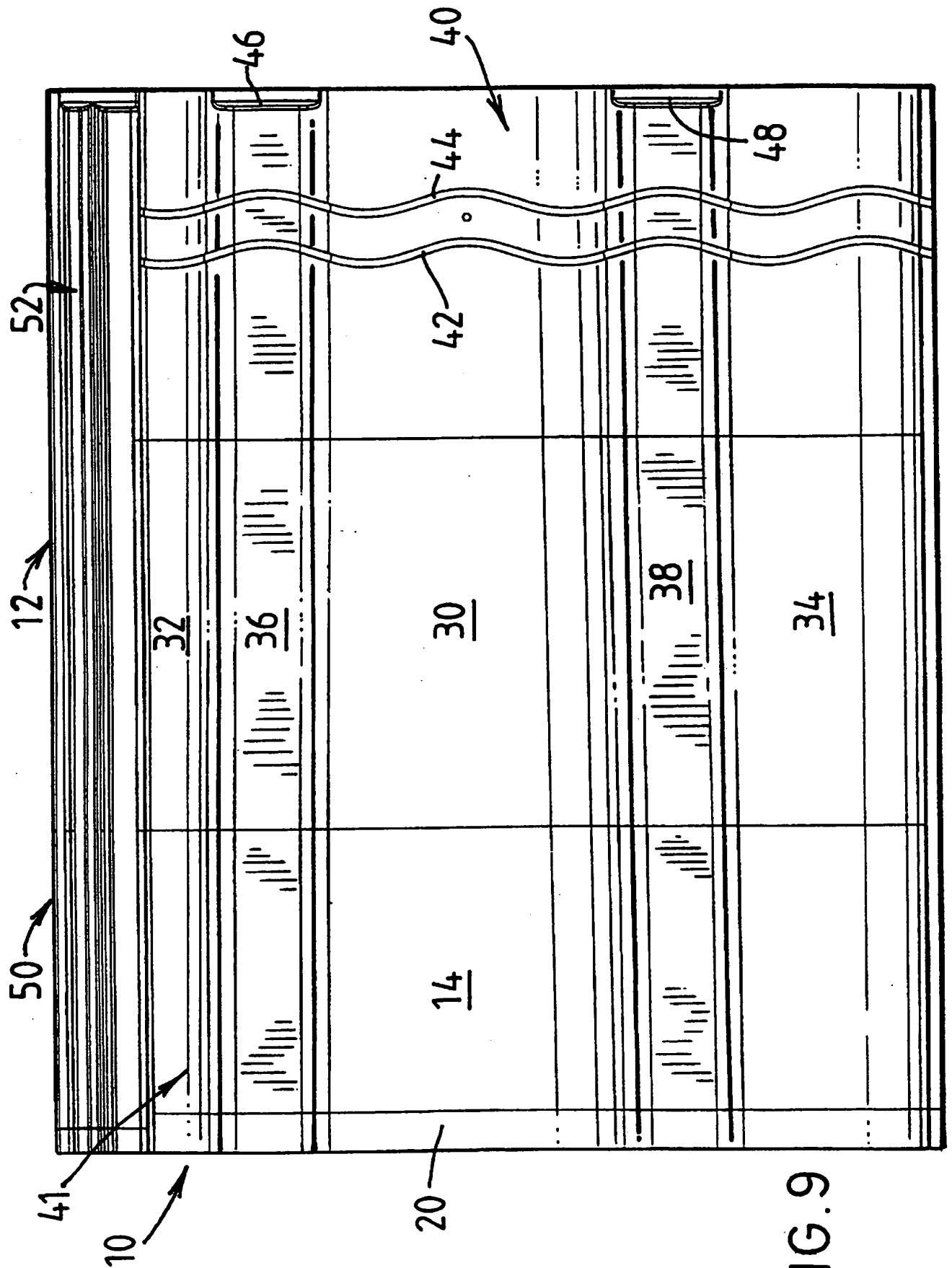


FIG. 9

10/10

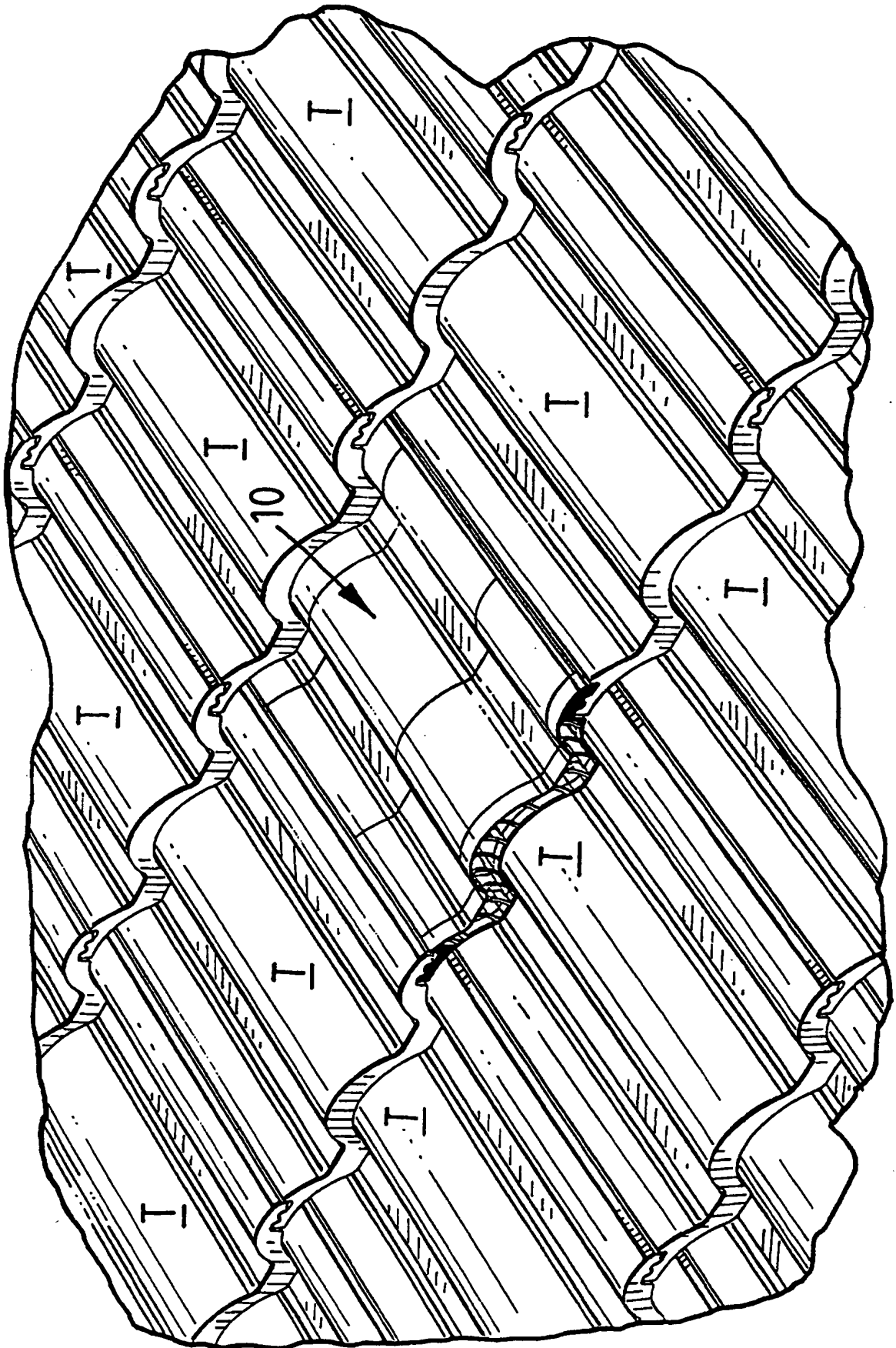


FIG. 10

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 97/05297

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 E04D1/30 E04D13/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 E04D F24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	GB 2 279 675 A (O'TOOLE) 11 January 1995 cited in the application see the whole document	1,2,5,8, 14 3,4,6,7, 9-13,15
Y A	EP 0 593 006 A (KLÖBER) 20 April 1994 see column 4, last paragraph - column 7, line 41; figures	1,2,5,8, 14 3,4,6,7, 9-13,15
A	DE 85 24 006 U (KNÖRNSCHILD) 28 November 1985 see page 10, paragraph 2 - page 12; figures	1-15



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

30 January 1998

Date of mailing of the international search report

06/02/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-2048

Authorized officer

Richetti R

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 97/05297

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2279675 A	11-01-95	NONE	
EP 593006 A	20-04-94	DE 9213900 U	17-02-94
DE 8524006 U	28-11-85	NONE	

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.